

LOCKHEED AIRCRAFT CORPORATION		ENGINEERING STUDY <input type="checkbox"/>		CHANGE PROPOSAL <input checked="" type="checkbox"/>		LAC -188				
DATE July 17, 1964		AFFECTS: WSPO <input type="checkbox"/>		PROJECT <input checked="" type="checkbox"/>						
NAME OF MAJOR COMPONENT		PART OR LOWEST SUBASSEMBLY		PART NO. & MODEL OR TYPE						
TITLE OF PROPOSAL : ENGINE PERFORMANCE INSTRUMENTATION PACKAGE										
NATURE OF PROPOSAL : SEE SHEET 2										
REASON FOR PROPOSAL : To provide an instrumentation package and evaluation program that will provide information necessary to analyze engine performance.										
ES		ESTIMATED COST AND TIME INVOLVED : ADDITIONAL FUNDING REQUIRED :								
CP		ESTIMATED COST FOR KITS OR PARTS : ADDITIONAL FUNDING REQUIRED : See June 1964 Task Report SP-1923, Task 2								
ITEMS AFFECTED BY PROPOSAL :										
SAFETY	MISSION EFFEC- TIVENESS	PERFORM- ANCE	OPERATING PROCEDURE	INTER- CHANGE- ABILITY	WEIGHT OR WEIGHT & BALANCE	TOOLS & SUPPORT EQUIPMENT	MAINTEN- NANCE PROCEDURE	SERVICE LIFE	FLIGHT MANUAL	MAINTEN- NANCE MANUAL
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EST. MAN/HRS. REQ'D. TO ACCOMPLISH CHANGE IN FIELD										
SOURCE OF PARTS FOR KIT GFAE, LAC, & P&W					AVAILABILITY ----- WEEKS AFTER APPROVAL See Page 7					
DISPOSITION OF SPARES AFFECTED NONE: THIS IS A TEMPORARY (TEST) INSTALLATION										
INITIATED BY : CUSTOMER & CONTRACTOR					APPROVED : 3 AUG 64			STAT		

NATURE OF PROPOSAL:

I. Provide modifications and instrumentation in Article 348 to provide for an extensive engine performance evaluation program. The provisions will consist of an instrumentation package, airframe modifications and engine modifications as described below. The instrumentation package and Kits of parts for engine and airframe modifications will subsequently be retained at LAC for future use.

A. Instrumentation Package - A flight test instrumentation package will be assembled for installation in the Q-Bay. It will consist of (LAC) flight test equipment and (LAC) and (GFAE) instruments as follows:

- (1) Integrated Control
- (2) Inverter
- (3) Oscilloscope
- (4) KD-7 Camera
- (5) A.O. Panel

The instruments mounted in the A.O. Panel are the same type as are used on the aircraft instrument panel. These instruments will be the following:

- (1) Q-409-1 Altimeter (GFAE)
- (2) 8DJ86AA1 Fuel Flow Indicator (GFAE)
- (3) MS2802 Elapsed Time Clock (GFAE)
- (4) 1701EX-8-04 Airspeed Indicator (GFAE)
- (5) MS28033-1 Tachometer (GFAE)
- (6) MS28009-1 Temperature Indicator (GFAE)
- (7) BHL85R-11B EGT Indicator (GFAE)
- (8) Two (2) each Autosyn Indicator (LAC)
- (9) Daystrom Self Balancing Potentiometer (LAC)
- (10) Veeder-Root Counter (LAC)

B. Airframe Modifications - The airframe and ship's equipment will be modified as follows:

- a. Install a R-185 Temp Probe (GFAE) on top of the fuselage at FS 319. (This probe will operate the MS28009-1 Temp Indicator on the A.O. Panel.)

NATURE OF PROPOSAL: (Cont'd)

B. (Cont'd)

- b. An additional 8DJ86LAA1 fuel flow indicator (GFAE) and one 8TJ59QAT-2 fuel flow transmitter (GFAE) will be provided. The two indicators and the transmitter will be calibrated as a matched set. One indicator will be installed on the A.O. Panel, one will replace the indicator on the ship's instrument panel, and the transmitter will replace the transmitter on the engine.
- c. A nose instrument boom will be provided to measure aircraft pitch and roll attitude. The assembly will consist of a tubular steel mast with attaching fittings and a YAA2601 head assembly (LAC). Wiring and boom attach fittings will be installed in the aircraft.

C. Engine Modifications - The engine assembly will be modified by adding provisions to monitor the following:

- (1) 1st Stage Compressor Discharge Pressure (P_{S3})
- (2) 2nd Stage Compressor Discharge Pressure (P_{S4})
- (3) Primary P & D Valve Discharge Pressure
- (4) Secondary P & D Valve Discharge Pressure
- (5) Engine RPM (N_1)

NOTE: Existing N_2 Indication will also be monitored.

- (6) Power Lever Position
- (7) Fuel Temperature at Fuel Control Inlet
- (8) Fuel Temperature at Fuel Control Outlet
- (9) Fuel Temperature at Fuel Totalizer
- (10) Fuel Control Case Temperature
- (11) Ambient Temperature Near Fuel Control
- (12) Turbine Discharge Total Pressure (P_{T7})
- (13) Engine Face Inlet Air Pressure Pattern
- (14) Provisions will be made to dump 15th Stage Compressor Air overboard on command to determine this effect.

For item (1) and (2) modified engine flanges will be supplied to allow for installation of two transducers. Signal conditioning equipment will be provided for oscillograph presentation.

NATURE OF PROPOSAL: (Cont'd)

C. (Cont'd)

For items (3), (4), and (12), plumbing, transducers and transducer mounting brackets will be provided.

For item (6), an autosyn position transmitter will be installed on the fuel control assembly. A phase sensitive demodulator will be used to condition this signal for the oscillograph.

For items (7) thru (11) thermocouple assemblies in appropriate fittings or bosses will be provided.

For item (12) a transducer will be supplied.

For item (13) a total head and static pressure monitoring system will be provided. This system will include an 8-bar rack assembly, mounted in a spare engine inlet adapter, with a spare generator fairing included. Each rake bar will have 5 total head probes except one which will have 4 extra probes. 4 flush static probes will be installed in the generator fairing and 4 in the inlet adapter. One extra total head probe for "Reference Pressure" will be installed in the inlet adapter.

Stainless steel plumbing lines will be used to connect all probes to a scani valve which will be mounted on the engine.

For item (14) the 1-inch line normally used to pressurize the pods will be used. A 1½ inch line will be added. These lines will dump overboard thru solenoid valves; pilot's controls will be provided for each line separately.

All of the parts for the engine modification will be supplied by LAC except the following which will be supplied by the engine manufacturer:

- (1) 1 each EGT Indication Amplifier
- (2) 5 each Dual EGT Probes and
- (3) 1 each 1st Stage Compressor Discharge
- (4) 1 each 2nd Stage Compressor Discharge Pressure Plate (LAC modified)

II. Fly Article 348 with instrumentation described above (except nose pitch and yaw boom) to establish basic instrumentation data. Approximately five local flights will be accomplished.

III. Engineering support will be provided as follows:

- A. Engineering as required to design, mock-up and install the instrumentation.
- B. Flight test and instrumentation. Engineering on local flights to gather, reduce and record base data.

NATURE OF PROPOSAL (Cont'd)

III. (Cont'd)

C. Field support at the O.L. by the following LAC personnel to provide services as required.

- (1) Three flight test engineers
- (2) One flight test analysis engineer
- (3) One test pilot
- (4) Five crewmen

COST BREAKDOWN:

Contract SP-1923

- I. Fabrication & Modification of Article #348
 - II. Flight Test Instrumentation Program
 - III. Field Support at O.L. for period 6-26-64 thru 7-17-64
- Total SP-1923, Cust. #1 *

* Approximately expended in FY '64

SCHEDULE:

Proposed completion will be upon return of contractor personnel from Field Support - W/E 7-19-64.